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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/899,852	Applicant(s) RIESS ET AL.	
	Examiner Kandasamy Thangavelu	Art Unit 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/9/01, 9/12/01*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☒ Other: *See Continuation Sheet*.

Continuation of Attachment(s) 6). Other: 1449 of 10/10/01, 5/8/02 and 12/13/02.

DETAILED ACTION

1. This communication is in response to the Applicants' Amendment dated May 11, 2005. Claims 2, 3, 5 and 17 were amended. Claims 1-19 of the application are pending. This office action is made non-final.

Specification

2. The disclosure is objected to because of the following informalities:

Page 16, Para 70, Line 1, "In an embodiment using an general constellation" appears to be incorrect and it appears that it should be "In an embodiment using a general constellation".

Appropriate correction is required.

Claim Objections

3. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

4. Claims 2 and 5 are objected to because of the following informalities:

Amended Claim 2, Line 1, "$P_{1j}{}^{\wedge max}$ represents the estimated constellation size" appears to be incorrect and it appears that it should be "$P_1{}^{\wedge max}$ represents the estimated constellation size".

Amended Claim 5, Line 6, "$P_{1j}{}^{\wedge max}$ represents the estimated value" appears to be incorrect and it appears that it should be "$P_1{}^{\wedge max}$ represents the estimated value".

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-19 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

6.1 Claim 1 states in part, "estimating a constellation size from a set of maximally-sized reliable symbols". **Krishnamoorthy et al.** (U.S. Patent 6,490,270) defines constellation size as the number of bits per symbol that are transmitted. **Isaksson et al.** (U.S. Patent 6,438,174) shows the coding of the bits in a QAM-64 constellation in Fig. 19. Therefore a QAM-64

constellation has a constellation size of 6 and a QAM-16 constellation has a constellation size of 4. The specification does not describe anywhere how the constellation size is estimated from a set of maximally-sized reliable symbols.

6.2 Claim 2 states in part, "P_{1j}^max represents the estimated constellation size". The estimation of the constellation size is not described in the specification anywhere. **Isaksson et al.** states that associated with each symbol is a complex number (I, Q) which determines the phase and amplitude of constellation point (CL18, L21-23); the decoder uses the constellation point (I, Q) to determine the bits associated with the constellation point (CL18, L58-59; Fig 19). The examiner contends that ***from a set of maximally sized reliable symbols, it is not possible to get the constellation size.*** This requires the knowledge of the shortest distance between the constellation points.

Isaksson et al. states that the shortest distance between neighboring points is a parameter of the constellation. From a maximally sized reliable symbols only the phase and amplitude of the maximally sized reliable symbol can be found. Then using the shortest distance between the neighboring points, it is possible to determine the maximum value of the index along an axis of the constellation. For example in a QAM-64, the maximum value of the index along the positive X axis will be 4. The order of the constellation which determines the number of points in the constellation can be determined from the maximum value of the index along the positive X axis. The order of the constellation will be 64 for a QAM-64 constellation, it being $(2*4)^2$. The maximum constellation size can be determined from the order of the constellation. For QAM-64, the maximum constellation size is $\log_2 64 = 6$.

Therefore, the examiner takes the position that "P_{1j}^max represents the estimated constellation size" is incorrect. Specification Page 16, Para 69 states that P_j^max is the initial estimate of the value of the maximum of the received constellation point along an axis. This contradicts with the statement "P_{1j}^max represents the estimated constellation size" used in this claim. Do the applicants intend to use their own definition of the constellation size to mean the initial estimate of the value of the maximum of the received constellation point along an axis?

The Examiner contends that the method used by the applicants for "estimating constellation points P_1^q within a square constellation with uniformly separated points" is incorrect. The constellation points for a constellation are prespecified and fixed. **Isaksson et al.** shows the constellation points for a QAM-64 constellation in Fig. 19. **Isaksson et al.** talks about the deviation of a received signal from a corresponding constellation point (CL2, L38-39) and associating an input signal in a range around a specified constellation point to a distinct value of this point (CL2, L50-52). **Isaksson et al.** talks about constellation points 0, 1, 2, and 3 corresponding to bit patterns (0,0), (0,1), (1,0) and (1,1) for a constellation based on two bits per symbol (CL18, 44-46). The decoder uses the constellation point (I, Q) to determine the bits of the constellation point (CL18, 58-59).

It appears that in calculating P_1^q from P_1^max, the applicants use the amplitude and phase value associated with the maximally-sized reliable symbol to calculate the amplitude and phase of the other constellation points and call this calculated value "constellation point". The Examiner contends that ***this approach is incorrect***. Each constellation point that was transmitted from the transmitter will have an associated amplitude and phase angle. When the signal is received at the receiver, the received signal will have amplitude and phase angle that differ from

the values of the transmitted signal due to signal impairment and intersymbol interference. Therefore the values of $P_1{}^{\wedge q}$ calculated from $P_1{}^{\wedge max}$ should not be used to estimate the reliability of symbols, but the actual values of the amplitude and phase angle of the received signal should be used for calculating the reliability of the symbol.

6.3 In claim 3, the examiner takes the position that "$P_{1j}{}^{\wedge max}$ represents the estimated constellation size along a J^{th} axis" is incorrect. Specification Page 16, Para 69 states that $P_j{}^{\wedge max}$ is the initial estimate of the value of the maximum of the received constellation point along an axis. This contradicts with the statement "$P_{1j}{}^{\wedge max}$ represents the estimated constellation size along a J^{th} axis" used in this claim. Additionally, the applicants have not described anywhere in the specification, the method of estimating the constellation size from the maximally-sized reliable symbols.

The statement, "M_J represents an order of the constellation along the J^{th} axis" is incorrect, since the order of the constellation does not vary with the axis of the constellation. Specification page 17, Para 70 states that M_J is the number of points along the J^{th} axis of the constellation.

6.4 In claim 4, the statement, "revising the estimate of the constellation size based on additional reliable symbols" is not supported in the specification, since the specification does not describe how the constellation size is estimated from the maximally–sized reliable symbols and what distance between the constellation points is used.

6.5 In claim 5, the Examiner takes the position that "the revising comprises estimating a second set of constellation points P_2^q" is incorrect. The constellation points are prespecified and fixed for a given constellation as explained in Paragraph 6.2 above. Therefore, constellation points cannot be estimated using the received signal. Additionally, the amplitude and phase of the received signal should be used in computing the reliability of the received signals and the amplitude and phase of the individual signals should not be estimated from the those of the maximally-sized reliable symbols.

In addition "that are associated with the constellation point q" is incorrect since q is defined as "an index provided along an axis of the cons".

6.6 In claims 6 and 7, the Examiner takes the position that, "calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate sample" and "$R_n = \Sigma_{i=-K1, i\neq 0}^{K2} (|P_{n-i}|\ c_i)$, where P_{n-i} is the value of a constellation point nearest to the sample y_{n-i} which is in proximity to the candidate sample y_n" are incorrect. The constellation point nearest a sample has an associated value which is given by the amplitude and phase of the transmitted signal. However, these values are fixed for a given constellation such as QAM-64. The reliability (quality) of the symbol depends on the amplitude and phase of the signal that is received and its deviation from those of the transmitted signal. See **Isaksson et al.** CL2, L36-42 and CL2, L49-54.

6.7 In claim 8, the Examiner takes the position that "the reliability of a two-dimensional candidate sample y_n is given by:

$R_n = \Sigma_{i=-K1, i\neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)} \cdot c_i$, where P_{1n-i} and P_{2n-i} respectively represent first and second dimensional values of a constellation point nearest to y_{n-i} which is in proximity to the candidate sample y_n" is incorrect. The constellation point nearest a sample has an associated value which is given by the amplitude and phase of the transmitted signal. However, these values are fixed for a given constellation such as QAM-64. The reliability (quality) of the symbol depends on the amplitude and phase of the signal that is received and its deviation from those of the transmitted signal. See Paragraph 6.6 above.

6.8 In claim 13, the Examiner takes the position that "adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}" is incorrect. The constellation point nearest a sample has an associated value which is given by the amplitude and phase of the transmitted signal. However, these values are fixed for a given constellation such as QAM-64. The reliability (quality) of the symbol depends on the amplitude and phase of the signal that is received and its deviation from those of the transmitted signal. See Paragraph 6.6 above.

6.9 In claim 14, the Examiner takes the position that "the adding adds a scaled value of the constellation point to the reliability factor" is incorrect. The constellation point nearest a sample has an associated value which is given by the amplitude and phase of the transmitted signal. However, these values are fixed for a given constellation such as QAM-64. The reliability (quality) of the symbol depends on the amplitude and phase of the signal that is received and its deviation from those of the transmitted signal. See Paragraph 6.6 above.

6.10 In claim 17, the Examiner takes the position that "determining whether any of a plurality of constellation points each associated with samples neighboring the candidate sample is within a predetermined threshold" is incorrect. The threshold used in identifying the constellation point associated with a received signal is half the shortest distance between two transmitted constellation points as per claim 15. See also, **Isaksson et al**, CL20, L55-56; **Abdelilah et al.** (U.S. Patent, 6,661,837), CL8, L16-20; CL15, L43-62. Therefore, for each received symbol, there will be one constellation point which is within the threshold (unless it is out of the maximum of the range of the constellation amplitude).

Additionally, "if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol" is incorrect. Constellation points cannot exceed the threshold, since they are is determined by using the threshold and determining if there are constellation points within the threshold from the received signal and neighboring samples. What happens when there are 15 neighboring samples and 14 of them have a constellation point within the threshold and one does not have a constellation point within the threshold?

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8.1 Claim 13 states in part, "A method of identifying reliable symbols, comprising, for a candidate sample y_n: iteratively, for i= -Kl to K2, i#0". The variables Kl and K2are undefined.

9. Claim 1 is rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01.

9.1 Claim 1 states, "A channel gain estimation method" and lists steps of identifying the reliable symbols and estimating the constellation size. However, it does not include a step of calculating the channel gain from the constellation size and signal strengths of the symbols received. Therefore the claim is incomplete as it omits essential steps.

Applicants' attention is directed to Page 17, Paragraph 72 of the specification which states, "The channel gain may be estimated as a ratio of the first constellation point estimate to the magnitude of the smallest transmitted constellation point".

Claim Rejections - 35 USC § 101

10. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

11. Claims 1-19 are rejected under 35 U.S.C. 101 because the claimed inventions are directed to non-statutory subject matter.

11.1 Method claims 1-5 are rejected for reciting a method that is not directed to the technological arts.

Regarding claim 1, this claim is directed at a channel gain estimation method. The claim specifies performing some calculations on already available data and making some decision based on the results. None of the limitations describe any type of computer-implemented steps. To be statutory, the utility of an invention must be within the technological arts. *In re Musgrave*, 167 USPQ 280, 289-90 (CCPA, 1970). The definition of "technology" is the "application of science and engineering to the development of machines and procedures in order to enhance or improve human conditions, or at least to improve human efficiency in some respect." (Computer Dictionary 384 (Microsoft Press, 2d ed. 1994)).

Dependent claims 2-5 depend on Claim 1 but do not add further statutory steps.

The limitations recited in claims 1-5 contain no language suggesting these claims are intended to be within the technological arts.

11.2 Method claims 6-12 are rejected for reciting a method that is not directed to the technological arts.

Regarding claim 6, this claim is directed at a reliable symbol identification method. The claim specifies performing some calculations on already available data and making some decision based on the results. None of the limitations describe any type of computer-implemented steps. To be statutory, the utility of an invention must be within the technological arts. See paragraph 11.1 above.

Dependent claims 7-12 depend on Claim 6 but do not add further statutory steps.

The limitations recited in claims 6-12 contain no language suggesting these claims are intended to be within the technological arts.

11.3 Method claims 13-16 are rejected for reciting a method that is not directed to the technological arts.

Regarding claim 13, this claim is directed at a method of identifying reliable symbols. The claim specifies performing some calculations on already available data and making some decision based on the results. None of the limitations describe any type of computer-implemented steps. To be statutory, the utility of an invention must be within the technological arts. See paragraph 11.1 above.

Dependent claims 14-16 depend on Claim 13 but do not add further statutory steps.

The limitations recited in claims 13-16 contain no language suggesting these claims are intended to be within the technological arts.

11.4 Method claims 17-19 are rejected for reciting a method that is not directed to the technological arts.

Regarding claim 17, this claim is directed at a method of identifying reliable symbols. The claim specifies making some decision based on already available data. None of the limitations describe any type of computer-implemented steps. To be statutory, the utility of an invention must be within the technological arts. See paragraph 11.1 above.

Dependent claims 18-19 depend on Claim 17 but do not add further statutory steps.

The limitations recited in claims 17-19 contain no language suggesting these claims are intended to be within the technological arts.

12. Claim 1- 5 would be statutory if claim 1 is written as a computer implemented method for channel gain estimation.

Claim 6-12 would be statutory if claim 6 is written as a computer implemented method for reliable symbol identification.

Claim 13-16 would be statutory if claim 13 is written as a computer implemented method of identifying a reliable symbol.

Claim 17-19 would be statutory if claim 17 is written as a computer implemented method of identifying reliable symbols.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

14. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

15. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jasper et al.** (U.S. Patent 5,553,102) in view of **Hassan** (U.S. Patent 5,901,185), and further in view of **Abdelilah et al.** (U.S. Patent 6,661,837).

15.1 **Jasper et al.** teaches a diversity reception communication system with maximum ratio combining method. Specifically, as per claim 1, **Jasper et al.** teaches a channel gain estimation method (Fig. 2, Item 205; CL2, L21-34; CL4, L41-43).

Jasper et al. does not expressly teach identifying reliable symbols from a sequence of captured data samples. **Hassan** teaches identifying reliable symbols from a sequence of captured data samples (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10, L43-53), because that allows estimating a group of symbols for which the associated error probability is less than a threshold (CL4, L37-44). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Jasper et al.** with the method of **Hassan** that included identifying reliable symbols from a sequence of captured data samples. The artisan would have been motivated because that would allow estimating a group of symbols for which the associated error probability is less than a threshold.

Jasper et al. does not expressly teach estimating a constellation size from a set of maximally-sized reliable symbols. **Abdelilah et al.** teaches estimating a constellation size from a set of maximally-sized reliable symbols (CL8, L14-20; CL14, L16-22; Fig. 11;CL15, L43-62; the Examiner has interpreted that the Applicants mean by the constellation size, the maximum index of the constellation points), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Jasper et al.** with the method of **Abdelilah et al.** that included estimating a constellation size from a set of maximally-sized reliable symbols. The artisan would have been motivated because that would allow correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword.

15.2 As per claim 4, **Jasper et al., Hassan** and **Abdelilah et al.** teach the method of claim 1. **Jasper et al.** does not expressly teach revising the estimate of the constellation size based on additional reliable symbols. **Abdelilah et al.** teaches revising the estimate of the constellation size based on additional reliable symbols (CL8, L14-20; CL14, L16-22; Fig. 11;CL15, L43-62), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Jasper et al.** with the method of **Abdelilah et al.** that included revising the estimate of the constellation size based on additional reliable symbols. The artisan would have been

motivated because that would allow correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword.

16. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 5,901,185) in view of **Isaksson et al.** (U.S. Patent 6,438,174).

16.1 As per claim 6, **Hassan** teaches a reliable symbol identification method (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10, L43-53); comprising:

if the reliability factor is less than a predetermined limit, designating the candidate sample as a reliable symbol (CL6, L37-44; CL10, L43-53).

Hassan does not expressly teach calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate sample. **Isaksson et al.** teaches calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate sample (CL2, L36-42; CL2, L44-48; CL2, L49-52; CL2, L64-66; the reliability factor is same as the deviation of the received signal from the corresponding constellation point), because that allows associating an input signal in a range around a specific constellation point to the distinct value of the point (CL2, L49-53). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included calculating a reliability factor of a candidate sample from constellation points

nearest to each of a plurality of samples in proximity to the candidate sample. The artisan would have been motivated because that would allow associating an input signal in a range around a specific constellation point to the distinct value of the point.

16.2 As per claim 17, **Hassan** teaches method of identifying reliable symbols (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10, L43-53); and designating the candidate sample as a reliable symbol (CL6, L37-44; CL10, L43-53).

Hassan does not expressly teach for a candidate sample, determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold; and if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol. **Isaksson et al.** teaches for a candidate sample, determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold; and if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol (CL2, L36-53), because that allows associating an input signal in a range around a specific constellation point to the distinct value of the point (CL2, L49-53). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included for a candidate sample, determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold; and if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol. The artisan would

have been motivated because that would allow associating an input signal in a range around a specific constellation point to the distinct value of the point.

17. Claims 7, 8 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 5,901,185) in view of **Isaksson et al.** (U.S. Patent 6,438,174), and further in view of **Abdelilah et al.** (U.S. Patent 6,661,837) and **Dent** (U.S. Patent 6,347,125).

17.1 As per claim 7, **Hassan** and **Isaksson et al.** teach the method of claim 6. **Hassan** does not expressly teach that the reliability factor R_n of the candidate sample is given by:

$$R_n = \Sigma_{i=-K1,\, i\neq 0}^{K2} (|P_{n-i}|\ c_{i,})\ \text{where}$$

P_{n-i} is the value of the sample y_{n-i} which is in proximity to the candidate sample y_n,

Kl, K2 are numbers of samples adjacent to the candidate sample, and

c_i is a coefficient. **Abdelilah et al.** teaches that the reliability factor R_n of the candidate sample is given by:

$$R_n = \Sigma_{i=-K1,\, i\neq 0}^{K2} (|P_{n-i}|,)\ \text{where}$$

P_{n-i} is the value of the sample y_{n-i} which is in proximity to the candidate sample y_n,

Kl, K2 are numbers of samples adjacent to the candidate sample (CL14, L63 to CL15), because that allows determining the new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average (CL14, L63-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included the reliability factor R_n of the candidate sample being given by:

$R_n = \Sigma_{i=-K1, i\neq 0}^{K2} (|P_{n-i}|,)$ where

P_{n-i} was the value of the sample y_{n-i} which was in proximity to the candidate sample y_n,

Kl, K2 were numbers of samples adjacent to the candidate sample. The artisan would have been motivated because that would allow determining the new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average.

Hassan does not expressly teach that P_{n-i} is the value of a constellation point nearest to the sample y_{n-i} which is in proximity to the candidate sample y_n. **Isaksson et al.** teaches that P_{n-i} is the value of a constellation point nearest to the sample y_{n-i} which is in proximity to the candidate sample y_n (CL2, L49-52), because that allows determining a parameter indicative of a deviation of a received signal from a corresponding constellation point (CL2, L36-42). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included P_{n-i} being the value of a constellation point nearest to the sample y_{n-i} which was in proximity to the candidate sample y_n. The artisan would have been motivated because that would allow determining a parameter indicative of a deviation of a received signal from a corresponding constellation point.

Hassan does not expressly teach that $R_n = \Sigma_{i=-K1, i\neq 0}^{K2} (|P_{n-i}|\ c_i,)$ where c_i is a coefficient. **Dent** teaches that $R_n = \Sigma_{i=-K1, i\neq 0}^{K2} (|P_{n-i}|\ c_i,)$ where c_i is a coefficient (CL4, L30-41), because that allows using the maximum likelihood sequence estimation to predict the received symbols; and the sequence giving the lowest error is used as the best decoded sequence (CL2, L43-52). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Dent** that included $R_n = \Sigma_{i=-K1, i\neq 0}^{K2} (|P_{n-i}|\ c_i,)$

where c_i was a coefficient. The artisan would have been motivated because that would allow using the maximum likelihood sequence estimation to predict the received symbols; and the sequence giving the lowest error would be used as the best decoded sequence.

17.2 As per claim 8, **Hassan** and **Isaksson et al.** teach the method of claim 6. **Hassan** does not expressly teach the reliability of a two-dimensional candidate sample y_n. **Isaksson et al.** teaches the reliability of a two-dimensional candidate sample y_n (CL18, L21-29; CL18, L58-59; CL20, L42-43; CL20, L35-41; CL2, L36-39; CL2, L44-49), because that allows determining a parameter indicative of a deviation of a received signal from a corresponding constellation point (CL2, L36-42). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included the reliability of a two-dimensional candidate sample y_n. The artisan would have been motivated because that would allow determining a parameter indicative of a deviation of a received signal from a corresponding constellation point.

Hassan does not expressly teach that the reliability of a two-dimensional candidate sample y_n is given by:

$$R_n = \Sigma_{i=-K1, i\neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)} \cdot c_i, \text{ where}$$

P_{1n-i} and P_{2n-i} respectively represent first and second dimensional values of a constellation point nearest to y_{n-i} which is in proximity to the candidate sample y_n,

Kl, K2 are numbers of samples adjacent to the candidate sample, and

c_i is a coefficient. **Abdelilah et al.** teaches that the reliability of a two-dimensional candidate sample y_n is given by:

$$R_n = \Sigma_{i=-K1, i \neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)}, \text{ where}$$

P_{1n-i} and P_{2n-i} respectively represent first and second dimensional values of sample y_{n-i} which is in proximity to the candidate sample y_n,

Kl, K2 are numbers of samples adjacent to the candidate sample (CL14, L63 to CL15), because that allows determining the new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average (CL14, L63-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included the reliability of a two-dimensional candidate sample y_n being given by:

$$R_n = \Sigma_{i=-K1, i \neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)}, \text{ where}$$

P_{1n-i} and P_{2n-i} respectively represented first and second dimensional values of sample y_{n-i} which was in proximity to the candidate sample y_n,

Kl, K2 were numbers of samples adjacent to the candidate sample. The artisan would have been motivated because that would allow determining the new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average.

Hassan does not expressly teach that P_{1n-i} and P_{2n-i} respectively represent first and second dimensional values of a constellation point nearest to y_{n-i} which is in proximity to the candidate sample y_n. **Isaksson et al.** teaches that P_{1n-i} and P_{2n-i} respectively represent first and second dimensional values of a constellation point nearest to y_{n-i} which is in proximity to the candidate sample y_n (CL2, L49-52), because that allows determining a parameter indicative of a deviation of a received signal from a corresponding constellation point (CL2, L36-42). It would have been

obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included P_{1n-i} and P_{2n-i} respectively representing first and second dimensional values of a constellation point nearest to y_{n-i} which was in proximity to the candidate sample y_n. The artisan would have been motivated because that would allow determining a parameter indicative of a deviation of a received signal from a corresponding constellation point.

Hassan does not expressly teach that $R_n = \Sigma_{i=-K1, i\neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)} \cdot c_i$, where c_i is a coefficient. **Dent** teaches that $R_n = \Sigma_{i=-K1, i\neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)} \cdot c_i$, where c_i is a coefficient (CL4, L30-41), because that allows using the maximum likelihood sequence estimation to predict the received symbols; and the sequence giving the lowest error is used as the best decoded sequence (CL2, L43-52). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Dent** that included $R_n = \Sigma_{i=-K1, i\neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)} \cdot c_i$, where c_i was a coefficient. The artisan would have been motivated because that would allow using the maximum likelihood sequence estimation to predict the received symbols; and the sequence giving the lowest error would be used as the best decoded sequence.

17.3 As per claim 14, **Hassan, Isaksson et al.** and **Abdelilah et al.** teach the method of claim 13. **Hassan** does not expressly that adding adds a value of the constellation point to the reliability factor. **Isaksson et al.** teaches that adding adds a value of the constellation point to the reliability factor (CL2, L49-52), because that allows determining a parameter indicative of a deviation of a received signal from a corresponding constellation point (CL2, L36-42). It would

have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included adding a value of the constellation point to the reliability factor. The artisan would have been motivated because that would allow determining a parameter indicative of a deviation of a received signal from a corresponding constellation point.

Hassan does not expressly teach that adding adds a scaled value of the constellation point to the reliability factor, the value scaled in accordance with a predetermined coefficient c_i. **Dent** teaches that adding adds a scaled value of the constellation point to the reliability factor, the value scaled in accordance with a predetermined coefficient c_i (CL4, L30-41), because that allows using the maximum likelihood sequence estimation to predict the received symbols; and the sequence giving the lowest error is used as the best decoded sequence (CL2, L43-52). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Dent** that included adding a scaled value of the constellation point to the reliability factor, the value scaled in accordance with a predetermined coefficient c_i. The artisan would have been motivated because that would allow using the maximum likelihood sequence estimation to predict the received symbols; and the sequence giving the lowest error would be used as the best decoded sequence.

18. Claim 9-13 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 5,901,185) in view of **Isaksson et al.** (U.S. Patent 6,438,174), and further in view of **Abdelilah et al.** (U.S. Patent 6,661,837).

18.1 As per claim 9, **Hassan** and **Isaksson et al.** teach the method of claim 6. **Hassan** does not expressly teach for any samples having similar reliability factors, prioritizing the samples based on the samples' values. **Abdelilah et al.** teaches for any samples having similar reliability factors, prioritizing the samples based on the samples' values (Fig. 11; CL15, L43-62), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included for any samples having similar reliability factors, prioritizing the samples based on the samples' values. The artisan would have been motivated because that would allow correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword.

18.2 As per claim 10, **Hassan** and **Isaksson et al.** teach the method of claim 6. **Hassan** teaches if the reliability factor is less than a predetermined limit, designating the candidate sample as a reliable symbol (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10, L43-53). **Hassan** does not expressly teach for any sample having a reliability factor that is less than the predetermined limit, comparing the sample's value against a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol. **Abdelilah et al.** teaches for any sample having a reliability factor that is less than the predetermined limit, comparing the sample's value against a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol (Fig. 11; CL15, L43-62),

because that allows identifying that the sample from the decision feedback equalizer exceeds the maximum limit and if so, incrementing a severe error counter, which can then be used to select the optimum data rate (CL16, L12-14; CL15, L17; CL17, L36-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included for any sample having a reliability factor that is less than the predetermined limit, comparing the sample's value against a second threshold and, if the value exceeded the threshold, disqualifying the sample as a reliable symbol. The artisan would have been motivated because that would allow identifying that the sample from the decision feedback equalizer exceeded the maximum limit and if so, incrementing a severe error counter, which could then be used to select the optimum data rate.

18.3 As per claim 11, **Hassan** and **Isaksson et al.** teach the method of claim 6. **Hassan** does not expressly teach for any samples having similar reliability factors, prioritizing the samples based on values of constellation points nearest to the samples. **Abdelilah et al.** teaches for any samples having similar reliability factors, prioritizing the samples based on values of constellation points nearest to the samples (Fig. 11; CL15, L43-62), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included for any samples having similar reliability factors, prioritizing the samples based values of constellation points nearest to the samples. The artisan would have been motivated because that would allow correlating the digital sample from

the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword.

18.4 As per claim 12, **Hassan** and **Isaksson et al.** teach the method of claim 6. **Hassan** teaches if the reliability factor is less than a predetermined limit, designating the candidate sample as a reliable symbol (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10, L43-53). **Hassan** does not expressly teach for any sample having a reliability factor that is less than the predetermined limit, comparing a value of a constellation point nearest to the sample to a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol. **Abdelilah et al.** teaches for any sample having a reliability factor that is less than the predetermined limit, comparing a value of a constellation point nearest to the sample to a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol (Fig. 11; CL15, L43-62), because that allows identifying that the sample from the decision feedback equalizer exceeds the maximum limit and if so, incrementing a severe error counter, which can then be used to select the optimum data rate (CL16, L12-14; CL15, L17; CL17, L36-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included for any sample having a reliability factor that was less than the predetermined limit, comparing a value of a constellation point nearest to the sample to a second threshold and, if the value exceeded the threshold, disqualifying the sample as a reliable symbol. The artisan would have been motivated because that would allow identifying that the sample

from the decision feedback equalizer exceeded the maximum limit and if so, incrementing a severe error counter, which could then be used to select the optimum data rate.

18.5 As per claim 13, **Hassan** teaches method of identifying reliable symbols (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10, L43-53); comprising:

for a candidate sample y_n:

iterativelyly, for i= - K_1 to K_2, i#0:

if the reliability factor exceeds a predetermined limit, disqualifying the candidate sample as a reliable symbol (CL6, L37-44; CL10, L43-53); and

otherwise, incrementing i and, if i=0, re-incrementing i for a subsequent iteration;

thereafter, unless the candidate symbol has been disqualified, designating the candidate sample as a reliable symbol (CL6, L37-44; CL10, L43-53).

Hassan does not expressly teach adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}. **Abdelilah et al.** teaches adding to a reliability factor a value of a sample y_{n-i} (CL14, L63 to CL15), because that allows determining the new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average (CL14, L63-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included adding to a reliability factor a value of a sample y_{n-i}. The artisan would have been motivated because that would allow determining the

new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average.

Hassan does not expressly adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}. **Isaksson et al.** teaches adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i} (CL2, L49-52), because that allows determining a parameter indicative of a deviation of a received signal from a corresponding constellation point (CL2, L36-42). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}. The artisan would have been motivated because that would allow determining a parameter indicative of a deviation of a received signal from a corresponding constellation point.

18.6 As per claim 15, **Hassan, Isaksson et al.** and **Abdelilah et al.** teach the method of claim 13. **Hassan** does not expressly teach that the predetermined limit is (K1+K2) d_{min} where d_{min} is half a distance between two constellation points that are closest together in a governing constellation. **Abdelilah et al.** teaches that the predetermined limit is (K1+K2) d_{min} where d_{min} is half a distance between two constellation points that are closest together in a governing constellation (CL14, L3 to CL15), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that

included the predetermined limit being (K1+K2) d_{min} where d_{min} was half a distance between two constellation points that were closest together in a governing constellation. The artisan would have been motivated because that would allow correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword.

18.7 As per claim 16, **Hassan, Isaksson et al.** and **Abdelilah et al.** teach the method of claim 13. **Hassan** does not expressly teach an annular constellation ring associated with the candidate symbol. **Isaksson et al.** teaches an annular constellation ring associated with the candidate symbol (CL18, L21-29; CL18, L58-59; CL20, L42-43; CL20, L35-41; CL2, L36-39; CL2, L44-49), because that allows determining a parameter indicative of a deviation of a received signal from a corresponding constellation point (CL2, L36-42). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included an annular constellation ring associated with the candidate symbol. The artisan would have been motivated because that would allow determining a parameter indicative of a deviation of a received signal from a corresponding constellation point.

Hassan does not expressly teach that the predetermined limit is the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol. **Abdelilah et al.** teaches that the predetermined limit is the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol (CL14, L3 to CL15), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56). It would have

been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Abdelilah et al.** that included the predetermined limit being the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol. The artisan would have been motivated because that would allow correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword.

19. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 5,901,185) in view of **Isaksson et al.** (U.S. Patent 6,438,174), and further in view of **Temerinac** (U.S. Patent 6,477,215).

19.1 As per claims 18 and 19, **Hassan** and **Isaksson et al.** teach the method of claim 17. **Hassan** does not expressly teach that the neighboring samples occur in a first window adjacent to the candidate sample on one side of the candidate sample; and the neighboring symbols occur in a pair of windows that are adjacent to, and on either side of the candidate sample. **Temerinac** teaches that the neighboring samples occur in a first window adjacent to the candidate sample on one side of the candidate sample; and the neighboring symbols occur in a pair of windows that are adjacent to, and on either side of the candidate sample (CL4, L13-24), because if the window extends over several successive symbols or the associated sample values, a very effective reliability value can be determined by a simple logic operation (CL4, L21-24). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Hassan** with the method of **Temerinac** that included the neighboring samples

occurring in a first window adjacent to the candidate sample on one side of the candidate sample; and the neighboring symbols occurring in a pair of windows that would be adjacent to, and on either side of the candidate sample. The artisan would have been motivated because if the window extended over several successive symbols or the associated sample values, a very effective reliability value could be determined by a simple logic operation.

Response to Arguments

20. Applicant's arguments filed on May 11, 2005 have been fully considered. The arguments with respect to 102 (e) and 103 (a) rejections are partly persuasive.

20.1 As per the applicants' argument that "Alouini does not estimate a constellation size from maximally-sized reliable symbols; ... the claimed method refers to identification of reliable symbols from a sequence of captured data samples; this occurs at a receiver, not a transmitter as is used in Alouini's system. ... Alouini is almost completely irrelevant to the claimed method; Hassan does not teach or suggest estimation of reliable symbols from a captured data stream", the examiner has used new references **Hassan** (U.S. Patent 5,901,185), and **Abdelilah et al.** (U.S. Patent 6,661,837).

Hassan teaches identifying reliable symbols from a sequence of captured data samples (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10,

L43-53), because that allows estimating a group of symbols for which the associated error probability is less than a threshold (CL4, L37-44).

Abdelilah et al. teaches estimating a constellation size from a set of maximally-sized reliable symbols (CL8, L14-20; CL14, L16-22; Fig. 11;CL15, L43-62; the Examiner has interpreted that the Applicants mean by constellation size, the maximum index of the constellation points), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56).

20.2 As per the applicants' argument that "Hassan does not calculate a reliability factor from samples in proximity to the candidate sample; while Hassan refers to "reliability" very generally, he does not identify how reliability of any specific sample is to be determined; Hassan certainly does not describe that the reliability of a candidate sample is determined from value of other samples, in proximity to the candidate sample; he does not describe calculating a reliability factor of a sample by considering the values of proximate samples, then comparing it against a predetermined limit; Hassan makes no mention of constellation points whatsoever", the examiner has used a new reference **Isaksson et al.**

Isaksson et al. teaches calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate sample (CL2, L36-42; CL2, L44-48; CL2, L49-52; CL2, L64-66; the reliability factor is same as the deviation of the received signal from the corresponding constellation point), because that allows

associating an input signal in a range around a specific constellation point to the distinct value of the point (CL2, L49-53).

20.3 As per the applicants' argument that "Claim 7 recites a mathematical formula for determining the reliability factor; neither Hassan nor Dent teaches or suggests this subject matter; the sum represented in claim 7 refers to neighboring sample positions (y_n-i) in a data stream; Dent describes operations performed when merging multiple data streams received from different prongs of a RAKE receiver into a common stream; Applicants see no similarity between Dent's system and the claimed invention", the examiner has used a new reference **Abdelilah et al.** (U.S. Patent 6,661,837).

Abdelilah et al. teaches that the reliability factor R_n of the candidate sample is given by:

$$R_n = \Sigma_{i=-K1,\, i\neq 0}^{K2} (|P_{n-i}|,) \text{ where}$$

P_{n-i} is the value of the sample y_{n-i} which is in proximity to the candidate sample y_n, Kl, K2 are numbers of samples adjacent to the candidate sample (CL14, L63 to CL15), because that allows determining the new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average (CL14, L63-67).

20.4 As per the applicants' argument that "Isaksson discloses switching between various constellations in certain scenarios; Isaksson does not disclose prioritization for the purposes noted in the claims; he does not disclose prioritization based on reliability factors or constellation points nor does he disclose disqualification of a sample based on the sample's own value", the examiner has used a new reference **Abdelilah et al.** (U.S. Patent 6,661,837).

Abdelilah et al. teaches for any samples having similar reliability factors, prioritizing the samples based on the samples' values (Fig. 11; CL15, L43-62); and for any samples having similar reliability factors, prioritizing the samples based on values of constellation points nearest to the samples (Fig. 11; CL15, L43-62), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56).

20.5 As per the applicants' argument that "Hassan compares test bits as received to their known values to determine reliability; he does not develop a reliability factor for a sample y_n from values derived from adjacent samples y_{n-i}; Dent is directed to merger of various information streams from multiple branches of a RAKE receiver to develop a merged data stream; neither reference includes any disclosure to suggest that a method would use values of a sample's nearest constellation point rather than the value of the sample itself in the reliability calculation", the examiner has used a new reference **Abdelilah et al.** (U.S. Patent 6,661,837).

Abdelilah et al. teaches adding to a reliability factor a value of a sample y_{n-i} (CL14, L63 to CL15), because that allows determining the new signaling alphabet by collecting a sufficient number of digital samples from the decision feedback equalizer and then computing their average (CL14, L63-67).

20.6 As per the applicants' argument that "Dependent claim 14 further recites that scaled value of a constellation point is added to the reliability factor; the Office Action speculates that the art provides a suggestion to add this scaled value because it increases signal strength;

Applicants suggest this rationale is incorrect", the examiner has used a new reference **Dent** (U.S. Patent 6,347,125).

Dent teaches that adding adds a scaled value of the constellation point to the reliability factor, the value scaled in accordance with a predetermined coefficient c_i (CL4, L30-41), because that allows using the maximum likelihood sequence estimation to predict the received symbols; and the sequence giving the lowest error is used as the best decoded sequence (CL2, L43-52).

20.7 As per the applicants' argument that "None of the cited art teaches or suggests the subject matter of claims 15 and 16 - wherein the predetermined limit is (K1+K2) d_{min} where d_{min} is half a distance between two constellation points that are closest together in a governing constellation; and the predetermined limit is the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol; . Isaksson does not teach or suggest developing a limit for reliability determinations or basing such a limit on distances between constellation points", the examiner has used a new reference **Abdelilah et al.** with **Isaksson et al.**

Abdelilah et al. teaches that the predetermined limit is (K1+K2) d_{min} where d_{min} is half a distance between two constellation points that are closest together in a governing constellation (CL14, L3 to CL15), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56). **Isaksson et al.** teaches an annular constellation ring associated with the candidate symbol (CL18, L21-29; CL18, L58-59; CL20, L42-43; CL20, L35-41; CL2, L36-39; CL2, L44-49), because that allows determining a parameter indicative of a deviation of a received signal

from a corresponding constellation point (CL2, L36-42). **Abdelilah et al.** teaches that the predetermined limit is the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol (CL14, L3 to CL15), because that allows correlating the digital sample from the decision feedback equalizer with a particular constellation point and ultimately a PCM codeword (CL15, L54-56).

20.8 As per the applicants' argument that "As per claim 17 Hassan does not teach or suggest this subject matter; he does not determine whether constellation points associated with neighboring samples have values that are within predetermined limits; Isaksson does not disclose this subject matter either; there is no motivation to combine the teachings of the references", the examiner has used a new reference **Hassan** (U.S. Patent 5,901,185) with **Isaksson et al.**

Hassan teaches method of identifying reliable symbols (CL5, L36-40; CL5, L44-46; CL6, L9-11; CL6, L20-24; CL6, L27-30; CL6, L37-44; CL10, L43-53); and designating the candidate sample as a reliable symbol (CL6, L37-44; CL10, L43-53). **Isaksson et al.** teaches for a candidate sample, determining whether any of a plurality of constellation points each associated with a sample neighboring the candidate sample is within a predetermined threshold; and if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol (CL2, L36-53), because that allows associating an input signal in a range around a specific constellation point to the distinct value of the point (CL2, L49-53).

20.9 As per the applicants' argument that "while Temerinac refers to tracking windows generally, his teachings have no application to the Hassan system where the values of the transmitted test bits are known and, therefore, reliability is determined from a comparison of the received test bits and the known values; providing a tracking window in the Hassan system would provide no further information", the examiner has used a new reference **Hassan** (U.S. Patent 5,901,185) with **Isaksson et al.** and **Temerinac.**

Temerinac teaches that the neighboring samples occur in a first window adjacent to the candidate sample on one side of the candidate sample; and the neighboring symbols occur in a pair of windows that are adjacent to, and on either side of the candidate sample (CL4, L13-24), because if the window extends over several successive symbols or the associated sample values, a very effective reliability value can be determined by a simple logic operation (CL4, L21-24).

Conclusion

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard, can be reached on 571-272-3749. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K. Thangavelu
Art Unit 2123
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